Patent No. 6,901,333
Request for Cert. of Correction dated October 31, 2005
Attorney Docket No. 0702-032079

CofC

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No.	:	6,901,333 B2 Confirmation No. 2640
Inventors	:	Van Riel et al.
Issued	:	May 31, 2005
Title	:	Method and Device for the Generation and Application of Anisotropic Elastic Parameters
Examiner	:	Donald McElheny, Jr.
Customer No.	:	28289

REQUEST FOR CERTIFICATE OF CORRECTION OF PATENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ATTENTION: Decision and Certificate of Correction
Branch of the Patent Issue Division

Sir:

In accordance with 35 U.S.C. §§254 and 255, we attach hereto Form PTO/SB/44 and a copy of proof of errors and request that a Certificate of Correction be issued in the above-identified patent. The following errors appear in the patent as printed:

(1) Face of Patent, page 2, second reference, H. Rutledal, in the tital, "as the Oseberg Field" should read -- at the Oseberg Field -- (See IDS filed 10/20/2004, PTO Form OMB 0651-0031.)

(2) Column 16, line 53, Claim 19, "seismic molding" should read -- seismic modeling -- (See application as filed, page 23, Claim 19, line 9.)

Error number (2) is an obvious typographical error made by Applicants. A check for $100.00 is attached to cover the fee for correction of Applicants' mistakes. Error number (1) is a printing error.

Respectfully submitted,
THE WEBB LAW FIRM

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PTO/SB/44 (04-05)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO.	:	6,901,333 B2
APPLICATION NO.	:	10/694,621
ISSUE DATE	:	May 31, 2005
INVENTORS	:	Van Riel et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Face of Patent, page 2, 2nd reference, H. Rutledal, in the title, "as the Oseberg Field" should read -- at the Oseberg Field --

Column 16, line 53, Claim 19, "seismic molding" should read -- seismic modeling --

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NOV 0 9 2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	10/694,621
Applicants	:	Paul VAN RIEL et al.
Filed	:	October 27, 2003
Title	:	METHOD AND DEVICE FOR THE GENERATION AND APPLICATION OF ANISOTROPIC ELASTIC PARAMETERS
Group Art Unit	:	2857
Examiner	:	Not Yet Assigned
Confirmation No.	:	2640
Customer No.	:	28289

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Sir:

Pursuant to the requirements of 37 C.F.R. §§1.56, 1.97 and 1.98, Applicants submit this Information Disclosure Statement together with a completed Form PTO/SB/08A, and a copy of each non-patent literature reference listed thereon. Since this application was filed after June 30, 2003, and according to the change in the 37 C.F.R. §1.98(a)(2)(i) requirement, no United States patent copies are enclosed.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to MAIL STOP AMENDMENT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on October 20, 2004.

Florence P. Trevethan
(Name of Person Mailing Document)

Florence P. Trevethan 10/20/2004
Signature Date

This Information Disclosure Statement identifies the prior art discussed by the Applicants in the present application. U.S. Patent No. 6,665,615 issued from Serial No. 09/817,807 identified on p. 3, line 8 of the present application. U.S. Patent No. 6,618,678 issued from Serial No. 09/579,695 identified on p. 4, line 4 of the present application.

Since this Information Disclosure Statement is being submitted before the mailing date of a first Office Action on the merits, it is timely under 37 C.F.R. §1.97(b)(3) and no fee is required. The Commissioner for Patents is hereby authorized to charge any additional fees which may be required to Deposit Account No. 23-0650. One (1) original and two (2) copies of this Information Disclosure Statement are enclosed.

Respectfully submitted,

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Please type a plus sign (+) inside this box → [+]

Approved for use through 10/31/2001. OMB 0651-0031
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet	2	of	3

Complete if Known	
Application Number	10/694,621
Filing Date	October 27, 2003
First Named Inventor	Paul Van Riel
Group Art Unit	2857
Examiner Name	Not Yet Assigned
Attorney Docket Number	0702-032079

OTHER PRIOR ART - NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, cite and/or country where published.	T[2]
		JOHN P. CASTAGNA and MILO M. BACKUS; "Offset-Dependent Reflectivity – Theory and Practice of AVO Analysis"; Investigations in Geophysics No. 8; pgs. 1-36; Society of Exploration Geophysicists, AVO Analysis-Tutorial and Review.	
		PATRICK CONNOLLY; "Elastic impedance"; THE LEADING EDGE; April, 1999; pgs. 438, 440, 442, 444, 446, 448, 450, 452.	
		IRSHAD R. MUFTI and RICARDO A.R. FERNANDES; "A wave-equation splitting algorithm for seismic modeling with applications to anisotropic media", 1998 SEG Expanded Abstracts (4 pgs.).	
		ARILD BULAND and HENNING OMRE; "D-39 Bayesian Seismic Inversion and Estimation in a Spatial Setting", EAGE 65th Conference & Exhibition-Stavanger, Norway, 2-5 June 2003 (pgs. 1-4).	
		ARILD BULAND and HENNING OMRE; "Bayesian linearized AVO Inversion"; GEOPHYSICS, Vol. 68, No. 1 (January-February 2003); Pgs. 185-198, 16 Figs., 3 Tables.	
		JAN L. FATTI, ET AL; "Detection of gas in sandstone reservoirs using AVO analysis: A 3-D seismic case history using the Geostack technique"; GEOPHYSICS, Vol. 59, No. 9 (September 1994): pgs. 1362-1376, 16 Figs., 1 Table.	
		BILL GOODWAY, ET AL.; "Improved AVO fluid detection and lithology discrimination using Lamé petrophysical parameters; "$\lambda\rho$", "$\mu\rho$", & "λ/μ fluid stack", from P and S inversions"; Canadian Society of Exploration Geophysicists 1998 Annual Meeting Expanded Abstracts, AVO 2.7, pgs. 183-186.	
		KLAUS BOLDING RASMUSSEN, ET AL.; "Rock Properties Prediction Through AVO Seismic Inversion"; NPF Geophysical Biennial Geophysical Seminar Expanded Abstracts; pgs. 107-110.	
		H. RUTLEDAL, ET AL.; "Time-Lapse Elastic Inversion at the Oseberg Field"; EAGE 64th Conference & Exhibition-Florence, Italy; May 27-30, 2002; pgs. 1-4.	
		G.C. SMITH and P.M. GIDLOW; "Weighted Stacking for Rock Property Estimation and Detection of Gas"; Geophysical Prospecting 35; 1987; pgs. 993-1014.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Unique citation designation number. [2]See attached Kinds of U.S. Patent Documents. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

A METHOD AND DEVICE FOR THE GENERATION AND APPLICATION OF ANISOTROPIC ELASTIC PARAMETERS

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates generally to a method of seismic data modeling and the interpretation and estimating of earth parameters from seismic data. More particularly, the present invention relates to a method of incorporating and accounting for the effects of anisotropy in seismic applications.

2. DESCRIPTION OF THE RELATED ART

[0002] Seismic data acquisition involves the generation of seismic waves in the earth using an appropriate source or sources and the recording of the response of the earth to the source waves. Seismic data is routinely acquired to obtain information about subsurface structure, stratigraphy, lithology and fluids contained in the earth's rocks. The seismic response is in part generated by the reflection of seismic waves in the subsurface where there are changes in those earth properties that impact seismic wave propagation. The process that describes how source signals propagate and how the response is formed is termed seismic wave propagation.

[0003] Modeling is used to gain understanding of seismic wave propagation and to help analyze seismic signals. In modeling, a model of earth properties is posed and a seismic wave propagation modeling algorithm is used to synthesize seismic responses. For purposes of the present invention, modeling is assumed to include the synthesis of the amplitudes of reflected seismic waves. Models of earth properties are often specified in terms of physical parameters. An example is the group of modeling methods that today are widely used to study changes in seismic reflection amplitudes with changing angle of incidence of a plane wave reflecting from a flat interface. See Castagna, J.P. and Backus, M.M., "Offset-dependent reflectivity – theory and practice of AVO analysis", 1993, Investigations in Geophysics vol. 8, Society of Exploration Geophysicists, chapter I. In this model, the two half-spaces above and below the interface are assumed to be homogeneous and isotropic so that each half-space can be described with just three earth parameters, for example p-wave velocity, s-wave velocity and density. In practice alternative triplets of parameters may be used, for example p-wave impedance, s-wave impedance and density. These parameters are referred to as elastic parameters. In some cases, modeling methods start from other earth parameters, and the transforms to elastic parameters are included as part of the modeling method.

15. The method according to claim 1, wherein the step of transforming elastic parameter data to anisotropic elastic parameter data is obtained by integration of anisotropic elastic parameter contrasts.

16. The method according to claim 15, wherein a low frequency component of the anisotropic elastic parameter data obtained by integration is replaced by a low frequency component from corresponding anisotropic elastic parameter data obtained with transform functions that operate on a point-by-point basis.

17. The method according to claim 1, wherein the anisotropy parameter data are transformed to anisotropy relative contrast parameters such that relative contrasts of the transformed anisotropy parameters approximate the contrasts in the anisotropy parameter data.

18. The method according to claim 17, wherein the transformed anisotropy parameters are normalized to achieve that when the anisotropy is zero the anisotropic elastic parameters equal the elastic parameters from which they are generated.

19. A method for approximating anisotropic seismic modeling by applying isotropic seismic modeling, comprising steps of:

obtaining earth elastic parameter data of an object of interest;

obtaining earth anisotropy parameter data of the object of interest;

transforming the earth elastic parameter data to obtain anisotropic elastic parameter data based on the earth anisotropy parameter data; and

applying isotropic seismic modeling on the transformed anisotropic elastic parameter data to produce anisotropic seismic data, the produced anisotropic seismic data being an approximation of seismic data obtained by anisotropic seismic molding.

20. The method according to claim 19, further comprising the step of substituting the anisotropic elastic parameter data for isotropic elastic parameter data in isotropic seismic modeling to produce the anisotropic seismic data.